C10 - C20 - C20 Vision

Numerical Controls

FIDIA

Giving shape to design

Innovative milling solutions

The C Class numerical control line can be installed on a wide range of machine tools: from traditional milling and boring machines to machining centres, including the most complex high speed milling systems.

The C Class products offers advanced features of functionality and flexibility to manage high levels of automation, from the simple pallet changer to the more complex FMS systems.
A wide range of hardware and software solutions, combined with a linear and compact design, ensure a high level performances for the milling of moulds and dies, models, aeronautical and general mechanical components.
The architecture with two separate processors, one for the operator interface and one for the real time, enables high milling performance in terms of quality and speed to be achieved. Moreover, thanks to Windows XP and the hardware solutions integrated on the C20, it is possible to install the innovative ViMill Fidia software or other applications for programming, measuring, monitoring etc.

To use at their best the NC features, Fidia also provides its XPOWER digital drives. A wide range of power modules can drive all the most common motors installed on machines tools: brushless, linear and torque motors, synchronous and asynchronous spindles. This means that Fidia provides all the electronic parts of the machine and guarantees its performances, functionalities and service in every part of the world. The expertise and professional competence of Fidia Service Dept. integrated in the supply ensure the investment's validity in time.

C20 Vision and ViMill™

Innovative milling solutions

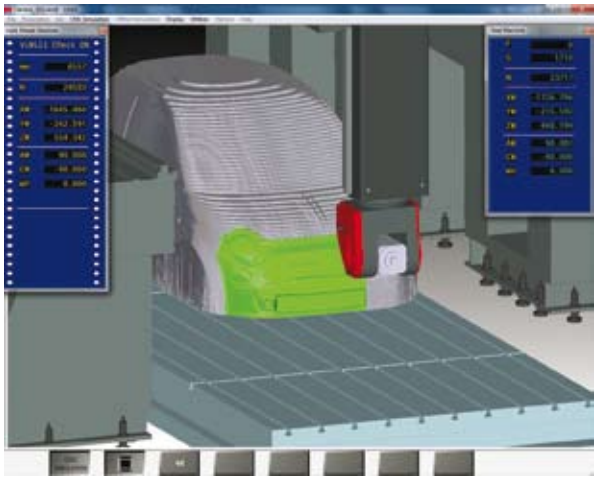
The C20 Vision numerical control with the integrated ViMill system allows the machine operator to visually check any possible collision or unexpected movements between tool, head and machine with the actual workpiece just before pressing the start push button or during the real milling process.

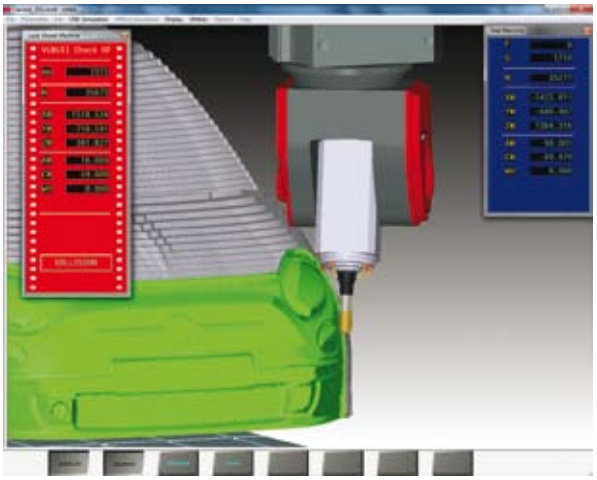
The ViMill function proves to be also very useful during machine operation and in case of program stop and re-start.
In fact, even if the part program has been duly verified with off-line simulation solutions, many CNC parameter settings can produce machine movements that are not possible to check using conventional off-line methods.

Using ViMill function, the operator can visually check all axes and movements at the most critical time, just before pressing start.

Besides, "like in a moviola video", using the CNC hand-wheel or the jog push buttons, the operator can virtually move the machine, back and forward, according to the selected part program with the actual set of CNC parameters and tools value defined.
It's very easy to verify the milling, to avoid rough mistakes and even check small undesired movements by using ViMill zooms and graphic functions.

Patent Pending





advanced technology

and features

Fidia controls have always been appreciated for their high level performance and for the comprehensive range of features supplied as standard. The architecture of Fidia NCs, with two separate processors, takes full advantage of the power of the dedicated CPU for axis and PLC management, based on a RISC Power PC. The PC section manages the operator interface: in this way, any programming or display task, even an onerous one, can be performed without interfering with the machining in progress.

All NC models include an industrial PC, complete with:

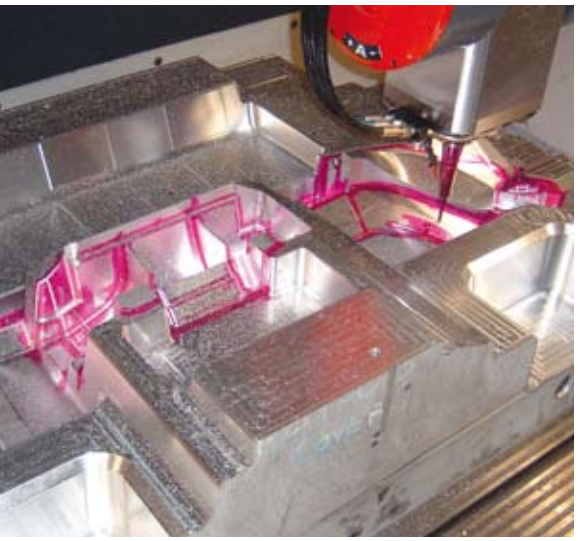
- Core 2 Duo on C20
  Pentium 4 on C10
- 2 GB RAM memory expandable to 4 GB
- 320 GB min hard disk
- N-vidia graphic board on C20
  integrated graphic board on C10
- 100 Mbit/s Ethernet interface (optional second Ethernet board)
- Windows XP operating system
- DVD read/write drive
- 4 USB ports
- RS232 serial interface and parallel port
- Audio inputs/outputs

The operator panel comprises:

- 15" TFT monitor TFT on C10 or 19" on C20
- compact 74 key keyboard (C10) or extended 101 key keyboard (C20)
- 16 softkey for management of the operator interface
- integrated industrial mouse (an external mouse can be applied)
- Additional USB mouse for ViMill
- pushbutton panel for machine functions with handwheel, 2 potentiometers, 2 pushbutton keys, emergency pushbutton and various custom buttons

milling

excellence



High quality machining

Speed and quality of machining of sculptured surfaces are the most well known and appreciated features of Fidia controls.

They are the result of a continued fine-tuning of various machining technologies in line with modern machine tool construction techniques (linear motors, digital or analog drives, machine tool axes with critical dynamics such as Gantry, tandem, etc.).

Close collaboration with major users and with important machine tool builders has led to the results achieved.

The 400 MHz RISC Power PC processor, guarantees extremely reduced times for the reading and elaboration of tool paths.

Special functions are especially provided to check paths:

- look-ahead with advanced feed control on bends and edges
- control of variations in acceleration
- Active Tuning for optimizing performance in terms of accuracy/ speed
- different parameter sets that can be recalled by G functions for defining different machining conditions (roughing out, semi-finishing and finishing)

High speed machining

Fidia has been a firm believer in high speed milling and has dedicated years of ongoing research to the development of new numerical control algorithms, achieving worldwide recognition from the early 1990s onwards.

The revolutionary combination of Fidia NCs with Fidia Xpower technology increases more than ever milling performances bringing them towards even closer to excellence.

The direct access to all the drive's parameters enables to control the motors and, therefore, the axes, in the best possible way even in the most critical condition of use, with lower response times compared to non-integrated solutions.

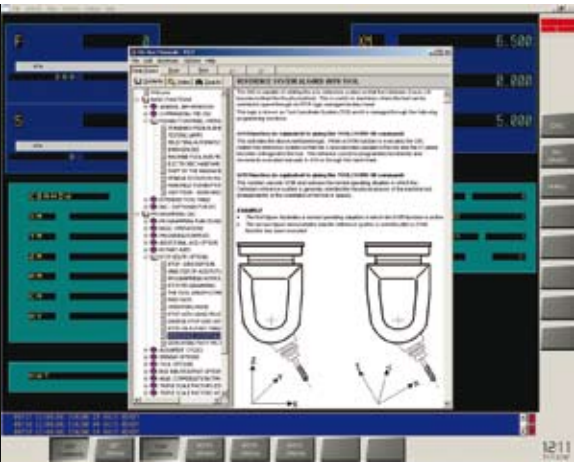
simple and reliable

to use

Menu and softkeys

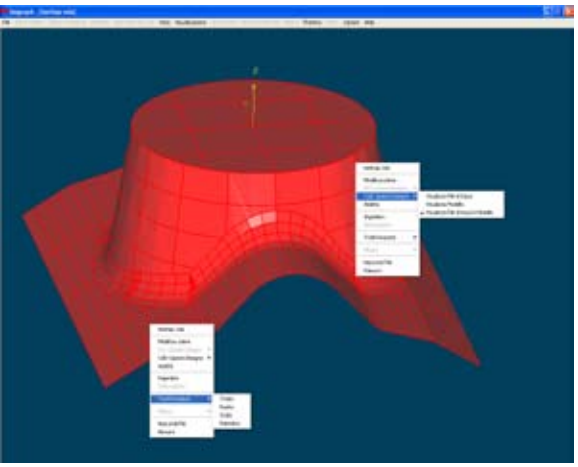
The graphics environment is intuitive and easy to use, while the set up of operations on the numerical control is further facilitated by the use of softkeys.

Switching between different operating environments (CNC, ISOGRAPH, HI-MILL) allows the user to perform simultaneous tasks with complete safety.



On line Help / Log file

All functions available on the numerical control, whether standard or optional, can be rapidly consulted by means of the on line Help. The log file records all events (messages, commands, etc.) sequentially to facilitate diagnostics, including remote diagnostics via Teleservice.



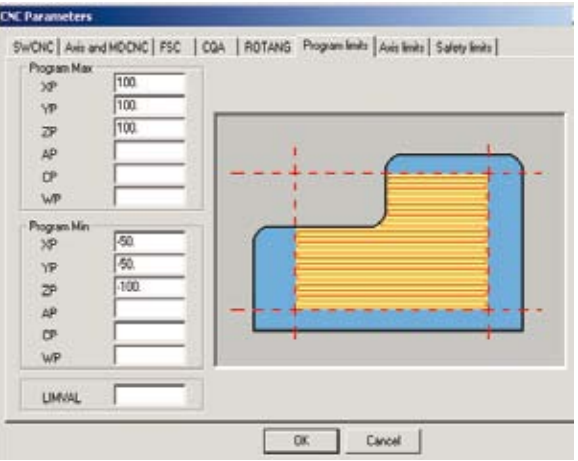
Graphics – 3D files visualization

Simulation of machining programs and graphic visualization of tool path both before and during the machining.

An optimized and even simultaneous visualisation for displaying large and different format files enables a quick check of the milling path.

Its main features as follows:

- visualization of the mathematical model laid upon the tool path;
- display of multiple paths marked with different colours;
- vertex coordinates measurements, distance between two points and angle formed by two segments for each loaded tool path;
- management of ISO-DXF/DWG-IGES-STL-VDA-FS-PRJ (HI-MILL project) formats



Parameters and procedures

Although the technical department usually checks all CAM programs, for several reasons (machine change, unexpected overall dimensions, change of the origins) the milling path could not be suitable for the machining.

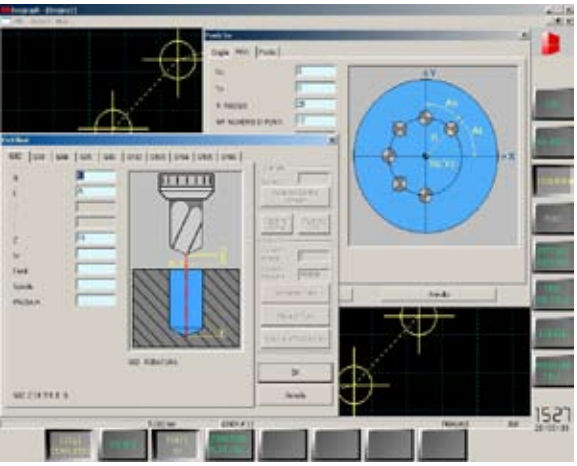
In such cases the tool path should be newly calculated, partially or in full, or the file should be modified (movement release clearance, shift of origins, axis switch, etc.).

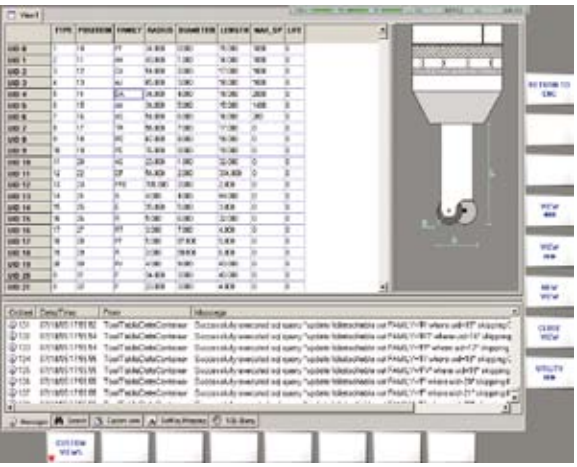
On Fidia controls instead, the operator can directly activate all these variations (roto-translation, scale factors, axis change, etc.) to the aid of suitable parameters but with no need to perform corrective actions on the part program.

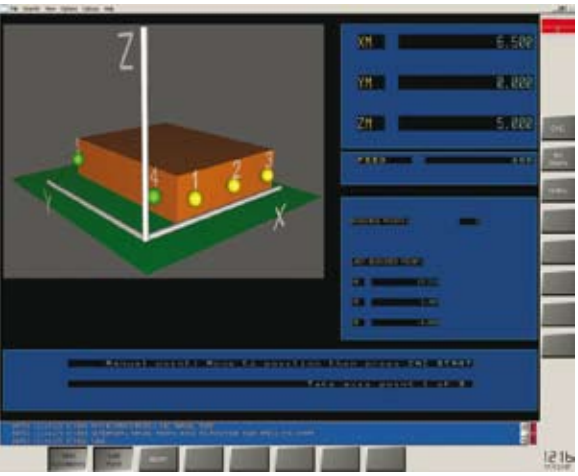
In addition to this, where changes are to be applied with a specific sequence on file parts or on several files, the programming through Procedures is provided allowing for an easy and maximum automation of part program sequences thus resulting in maximum efficiency.

simple and reliable

to use







Operator Functions

In any kind of 3 or 5 axis machining, with continuous or indexed heads, when there is an unexpected breakdown there must be a quick and simple intervention. Included in the Fidia NC are special functions that make easier for the operator doing the following procedures:

- automatic re-positioning of the tool on the part, with 3 and 5 axes, following manual retraction using the “Retract” function
- translation of the tool along its axis during machining by means of the electronic handwheel (virtual quill)
- fast and flexible cycle resume with optional re-execution of graphics and the ability to re-position one axis at a time

Extended Tool Table

It enables to define up to 10000 tools identifiable with a 16 alpha-numerical name that can be called from the part-program. The table can be customized by inserting fields handled by the PLC and can be exported according to the Windows standard formats.

Also the visualization can be customized by choosing the columns and by defining the sort order of rows.

The tool table completion can be performed directly on the machine or it can be done externally and then transmitted to the NC via the network or via the USB port.

The combination with the tool identification systems results particularly useful within a tool centralized management.

Piece Alignment

To avoid time-wasting operations on the machine it may be useful to use the FIDIA piece alignment features. To this purpose some specific dialog pages with graphic support can guide the operator in calculating and activating the suitable rotations. The alignment cycles can be performed with digital probes or more simply with a tool: in the latter case the points have to be collected manually.

Several cycles are provided referring to the geometrical elements available on the piece: working surface, holes, pins.

On machines with swivelling head, rotation for piece alignment may also be applied to rotary axes, so that even in 5-axis paths the tool will keep the proper orientation in relation to the piece.

RTCP

5-axis machining

Applied to bi-rotary heads and roto-tilting tables, the RTCP function manages tool length compensation in space, directly from the machine tool. A 5-axis tool path can therefore be programmed without having to consider the pivot that will be inserted in the NC tool table before the program is executed.

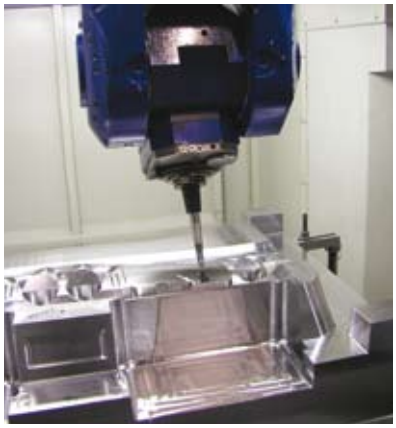
RTCP features:

- controlled feed at the tool tip
- management of orthogonal, angular and eccentric heads
- "virtual quill": manages an axis oriented in the tool direction for executing drillings and release movements.
- rotation and/or translation on 5 axis
- rotation of the reference system (G194): applied to programmed movements and to those executed by jog and handwheel.
- the TCPhs function (hyper smooth) allows to reduce the sudden movements introduced from RTCP compensation in specific situations; the resulting machine movements are smoother, for the benefit of the work-piece surface quality and of the machine mechanical parts.

The RTCP function can also be used for 3-axis programs: by orientating the head or table manually, the tool tip is maintained in contact with the part.

RTCP and HMS

Combining the RTCP function with the HMS head calibration system is a winning and unique formula in 5-axis milling technology, with clear benefits for accuracy of movement at the tool tip.



HMS

Head

Measuring

System

The HMS system is a device designed for measuring and checking continuous and indexed bi-rotary heads and roto-tilting tables. Equipped with 3 sensors connected to the CNC, the HMS system is managed by a specific measurement software. By processing incoming data in real time, the software is able to check and correct geometric error, positioning accuracy and the RTCP parameters for the heads and tables.

HMS is a high-precision instrument and provides an alternative to the traditional checking method using dial gauges. It has many advantages:

- a drastic reduction in checking time (half an hour rather than an entire day)
- measurement of all head and/or table positions (not just orthogonal positions)
- measurement of RTCP parameters
- automatic insertion of correction values in the CNC.

Easy to install and use, HMS can also be used by operators with no particular expertise. This means head geometry checks can be performed whenever necessary, avoiding lengthy and costly service interventions and reducing machine tool downtime.
A full report is available at the end of the calibration cycle detailing the measurements made and the compensation values inserted.
Errors are represented graphically for the best interpretation of head conditions and to assess the suitability of scheduling a service intervention for the mechanical parts.

The HMS device is available in two different versions, standard and compact, to adapt to machine tool axis working travel for executing the cycles.

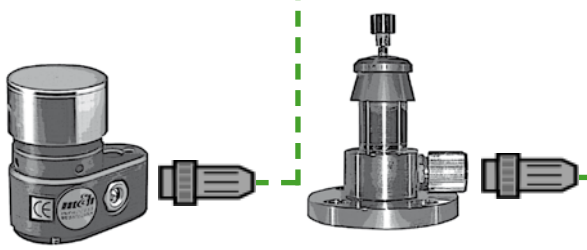
The equipment and the application have been granted a European patent No. 1549459.

C10 Operator Panel

C20 Operator Panel

HPX21

HPJ21



Tool setting probes

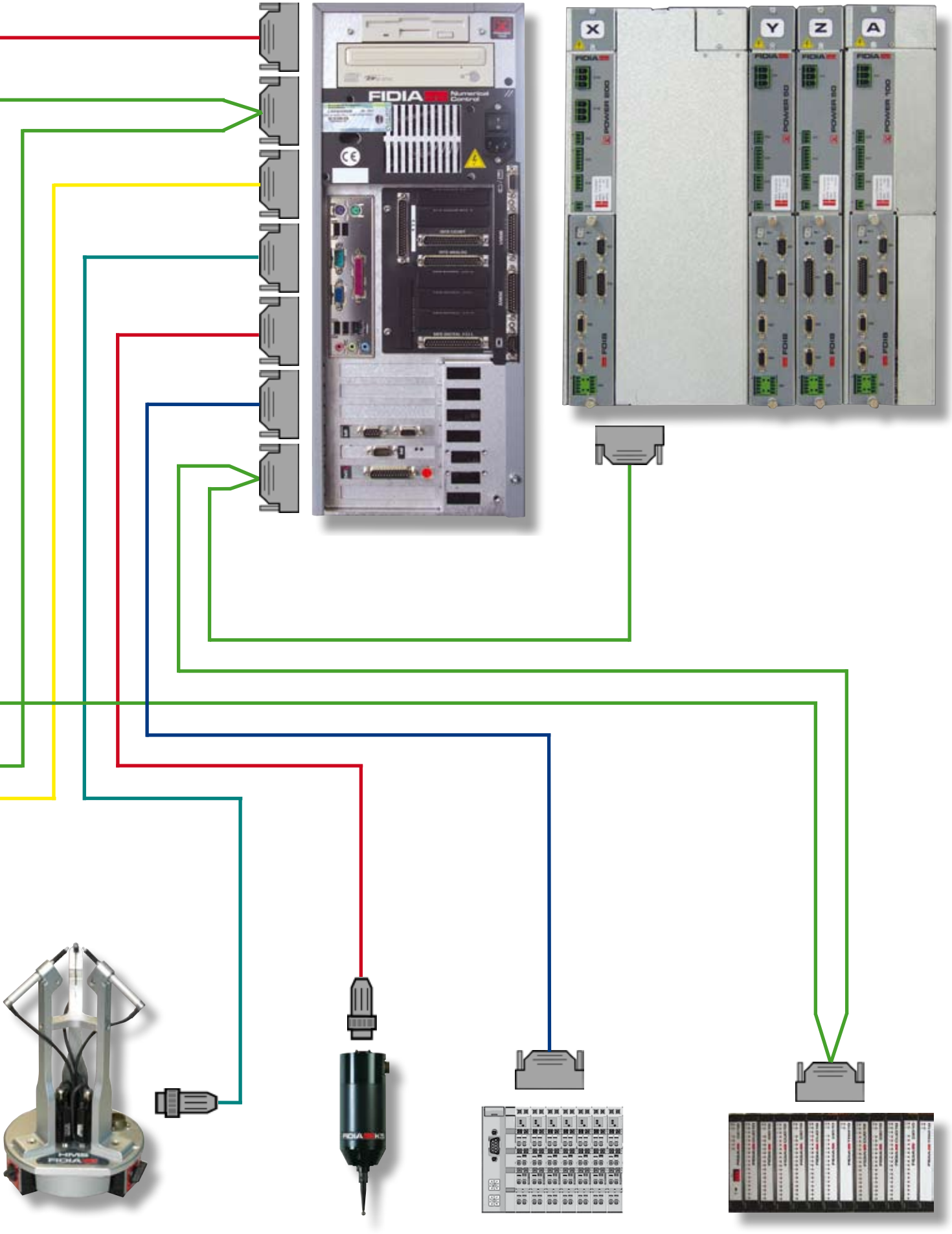
Measuring Probe

TMSC Laser Tool Setting

Head

C20 Rack

XPower Drives



HMS
Measuring System

K5
Tracer

Profibus mo-
dules

I/O LUX
modules

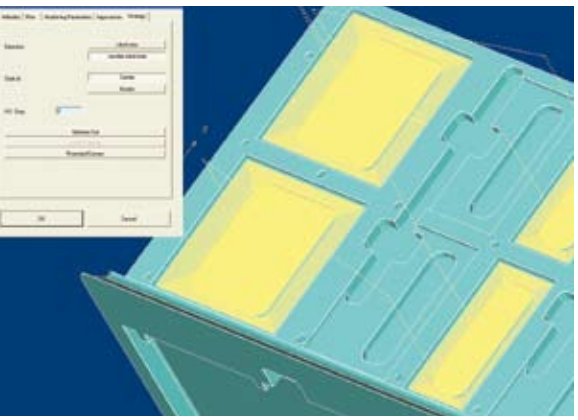
ISOGRAPH, the 2½D CAD/CAM

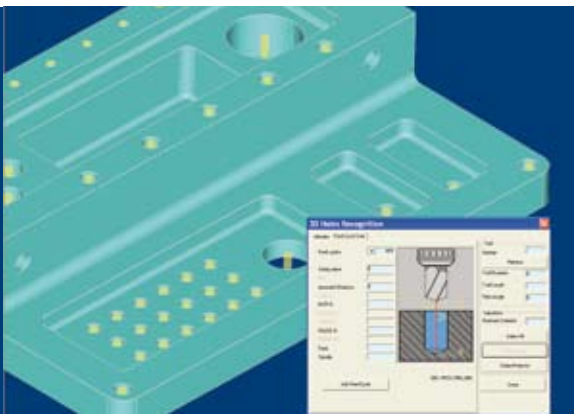
simple and

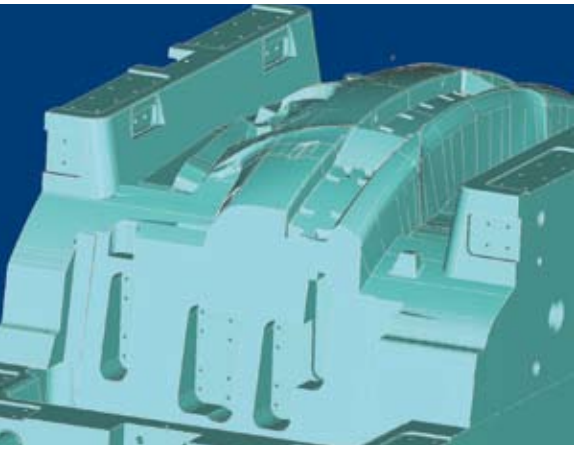
comprehensive

programming

ISOGRAPH is a 2½D CAD/CAM that is especially suited to workshop use with its highly innovative user interface. The system is ideal for all situations where service machining has to be quickly programmed and executed, such as: pocket milling, flattening, the machining of profiles, drilling, boring and so on.
The use of the softkeys and mouse makes it easily and immediately accessible to all operators, even those with no specific programming knowledge.







With ISOGRAPH, the operator can:

- define geometric elements and profiles thanks to the powerful and intuitive GRAPHICS EDITOR
- use the ISOGRAPH programming language to generate even very complex machining cycles
- manage ISO and ISOGRAPH files
- import geometric elements written in the DWG and DXF formats
- generate tool paths with tool radius compensation on any plane
- generate paths for the automatic re-machining of residual material
- generate fixed drilling, tapping and boring cycles, also when repeated along pre-defined profiles
- generate complex cycles for the milling of pockets with rectangular, circular or generic profiles, and slots
- generate flattening cycles
- use the integrated environment for writing and simulating CNC Procedures

IGES interface

Files can be imported in IGES format from which 2½D tool paths can be generated, for example drilling cycles and pocket milling.
For drilling and pocket milling, the associated geometric elements are interpreted with automatic recognition of the machining start and end values.
When milling pockets, any internal islands of material are detected and automatically excluded from the machining.
All machining operations can be executed on orthogonal planes as well as on inclined planes.

HI-MILL, the 3D CAM

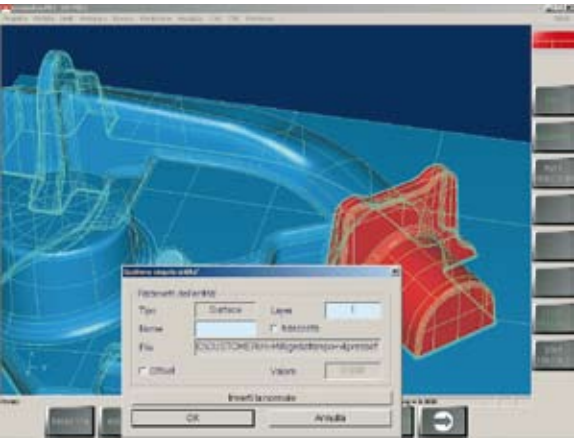
CAM

directly on the

machine tool

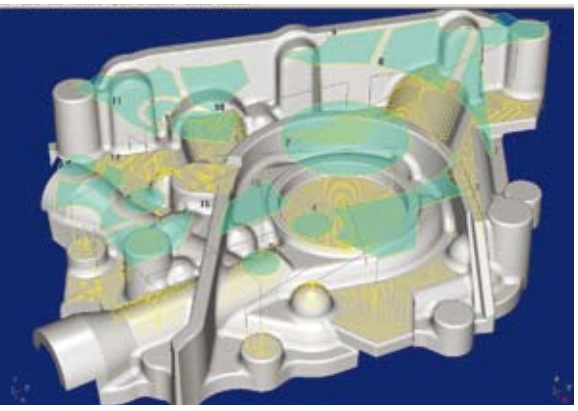
HI-MILL is a 3D CAM that is perfectly integrated in the Fidia numerical controls and therefore a very useful tool for programming in the workshop.
With HI-MILL the operator has a simple and essential interface: any type of operation becomes easy and spontaneous.

HI-MILL allows for the generation of tool paths from roughing out to super-finishing with a complete range of machining strategies. It also manages the bi-tangency and radii re-machining with reference to the previously used tool.

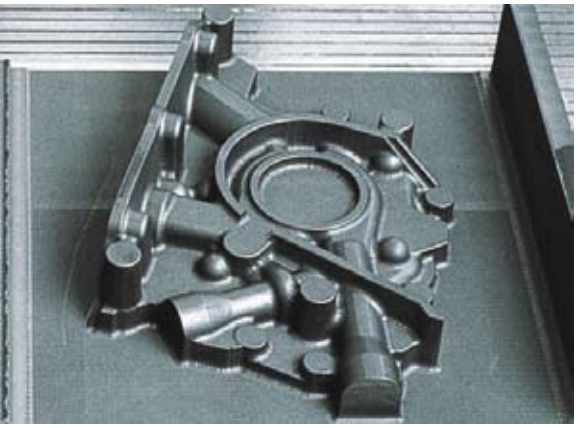


HI-MILL imports mathematical models in IGES, VDA, STL formats as well as physical models obtained by means of mechanical or laser tracers.
Furthermore, with an optional module, it can read the native CATIA language.

There are also CAD features for the generation of elementary surfaces, offset, functions for surface rotation and translation.

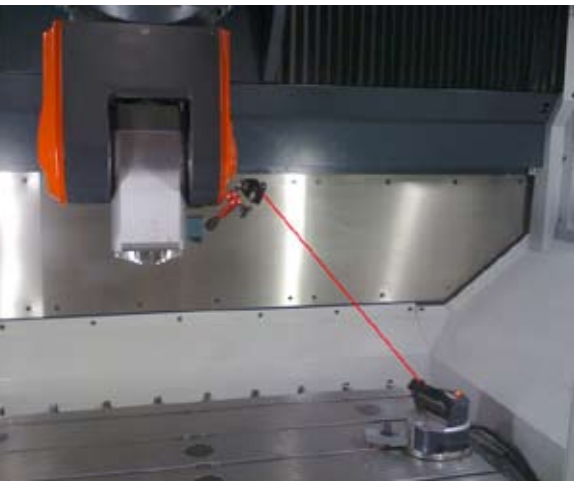


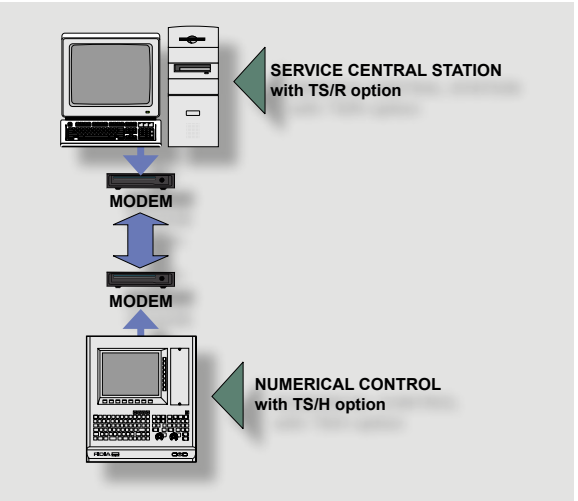
An integrated display module for the rough part is the product of the simulation of individual tool paths calculated with any tool inclination. Machining stock is highlighted with varying colours according to the quantity of residual material. The machine operator can define the technological parameters on the basis of actual tooling availability. The system operates in real time: the machining is started in parallel with the tool path calculation.
HI-MILL is suitable for any type of milling machine, either traditional or high speed, with a continuous or indexed bi-rotary head. A complete range of machining strategies, with all related parameters, allows for the efficient machining of any material.



solutions for

all requirements





VAC – Volumetric Compensation

The growing demand for precision in the machined parts is driver by economic and technological considerations. The typical positioning or backlash error compensation may not be sufficient to ensure the required tolerance. For this reason there are now systems that, through specific laser equipment, are able to measure the typical errors of a machine tool in the working volume. Fidia VAC software (Volumetric Axis Calibration) is able to interpret the values written in a special table and compensate the positions of the machine axes in real time. In the VAC software table you can define a positioning error, two straightness errors and three angular errors for each axis, in addition to three squareness errors for a total of 21 errors on the three machine axes.

PLP – Copying

Through the K5 analog tracer it is possible to make the scanning of 3D forms for digitizing the path as X-Y-Z coordinates that can be immediately executed by the NC. The most important features are:

- Copying and digitizing of models with a complete range of automatic cycles
- Copying according to a programmed path (TNC)
- Self-adjusting feed according to the curvature of the path
- Manual copying

Tool Life

Tool life management through tool family programming. When the tool life has run out, the tool is replaced by another tool from the same family having a life greater than zero.

Teleservice

Remote management of the NC via a telephone line, ISDN line or similar for diagnostics, data exchange and general maintenance.

the open NC

External Applications

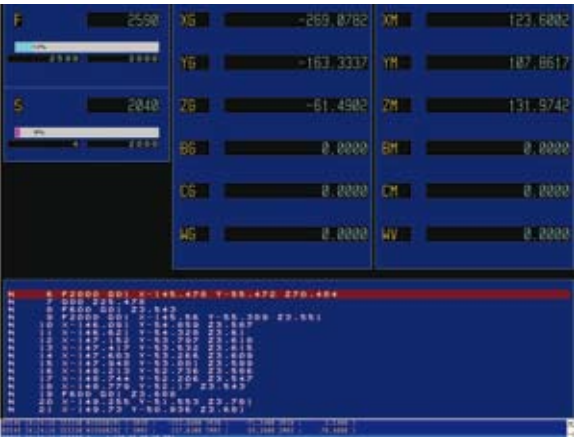
From its first installation on a PC base in 1995, the Fidia NC has been open to all applications in the Windows environment. Over the years, software for all types of requirements has been installed on Fidia NCs:

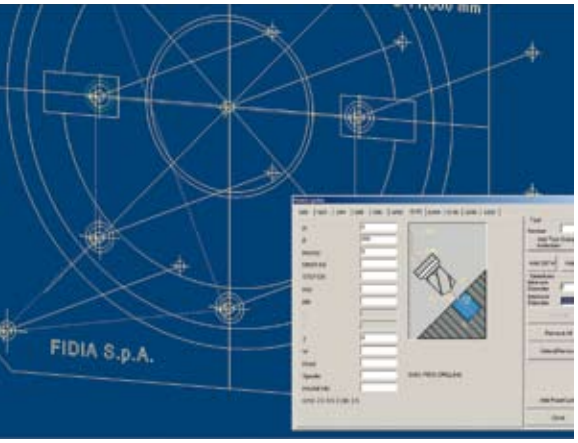
- CAD/CAM
- measurement and testing
- monitoring and display

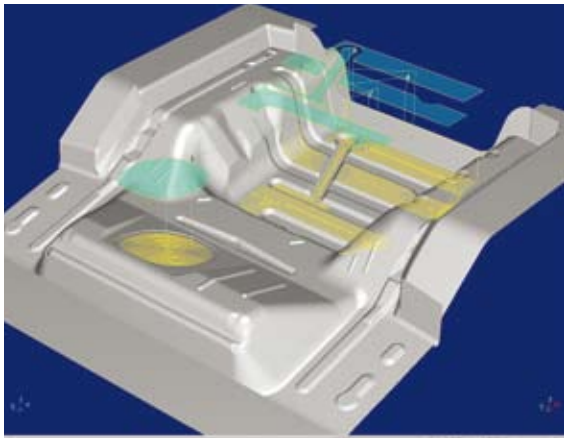
Applications integrated with the numerical control can also be developed owing to the standard CORBA interface that makes the Fidia NC open to the most widely used operating systems and programming languages.
Through the CORBA developing kit and its interface licence is possible to read, by TCP-IP, NC parameters and PLC registers.

Software and hardware updates

The numerical control structure allows for simple and fast updating of NC software as well as ISOGRAPH and HI-MILL applications.
The NC architecture with its double processor also allows for hardware upgrades by replacing all or part of the PC (memory, hard disk, network boards) without modifying the other components.
In this way, the control can always be kept up to date by implementing both hardware and software innovations as they become available.







Numerical controls

C10

The Fidia C10 control is composed of an operating panel with 15" LCD TFT and a separate IPC-CNC rack. The pushbutton panel with hand-wheel is designed so that all relevant manual machine functions, such as jog, rapid feed or spindle functions, can be performed in an intuitive way.

In order to enable control from two areas for machines with long axis travel, a second operating panel with LCD TFT display and keyboard can be connected.

Due to its versatility and its modular design this control is suited for many machine concepts.

The Fidia C10 has been developed for small and medium-sized milling centers which are equipped with a roto-tilting table or with one rotary axis in the table and one in the milling head. For this configuration, all RTCP functions are available.

C20

The Fidia C20 high end control can be equipped with a 19" LCD TFT display. Apart from the Fidia software applications, it also supports other software products, such as Viewer CAM systems or measuring software that may run in parallel.

The IPC – CNC rack comes up with state of the art PC hardware and a Microsoft operating system.

The C20 pushbutton can also have an additional 9 buttons kit for a better customisation of the machine functions.

In order to enable control from two areas for machines with long axis travel, a second operating panel with LCD TFT display and keyboard can be connected.

The C20 fulfills highest demands for complex applications where 5-axis HSC machining with RTCP and a large number of drives (Gantry, Tandem, multiple axes) must be managed simultaneously.

The C20 manages complex upper Gantry machines with 12-14 motors for 5 axes as well as heavy portal-type machines with different exchangeable head systems and spindles. It is possible to manage up to 32 digital drives with linear motors, torque motors or conventional motors. The C20 is therefore the right choice for all complex machines.

Accessories

HPX21

Handheld pushbutton panel with handwheel, two potentiometers for feed and spindle rpm, 16 configurable pushbuttons, 2 pushbuttons for handwheel resolution, display for axis position values, feed and spindle rpm. Available with a spiral cable (max. 4.5 metres) or a metal sheath cable with a length of either 8 or 13 metres.

HPJ21

Handheld pushbutton panel with handwheel, feed potentiometer, 3 pushbuttons for axis selection and handwheel resolution, 2 pushbuttons for axis movement in jog, HOLD and RELEASE buttons. Available with a spiral cable (max. 4.5 metres) or a metal sheath cable with a length of either 8 or 13 metres.

TMSC/U100

A laser device for tool measurement which measures the length, diameter and shape of 10 different types of tool (spherical, toric, cylindrical, etc.).

K5

The K5 parallel high deflection tracer (± 5 mm) is compact and can be mounted in the spindle taper, making it particularly suitable for digitizing.

Fidia digital drives

XPOWER

Fidia Digital Drives

Fidia XPOWER series digital drives have been designed to solve all axis and spindle movement problems. Ideal for mounting on a wide range of machine tools, the drives are particularly suited to milling machines and machining centres.

Main characteristics:

- FULL DIGITAL drives with DSP 32 bit processing
- 90 Mbit/s proprietary FFB bus
- programmable switching frequency to optimize the thermal performance of the motor: up to 8 kHz for the axes, up to 16 kHz for the electrospindle
- encorder interface or ENDAT for motor position feedback
- optical scale axis interface or ENDAT
- PTC input for measuring the motor temperature
- parameter setting software integrated in the NC
- 64 parameter sets per axis
- 9 configurable filters (notch, low-pass or generic).

A wide range of modules with different widths (from 50 mm to 300 mm) can drive motors using 10A up to 200A nominal current power.

Machine tool interface

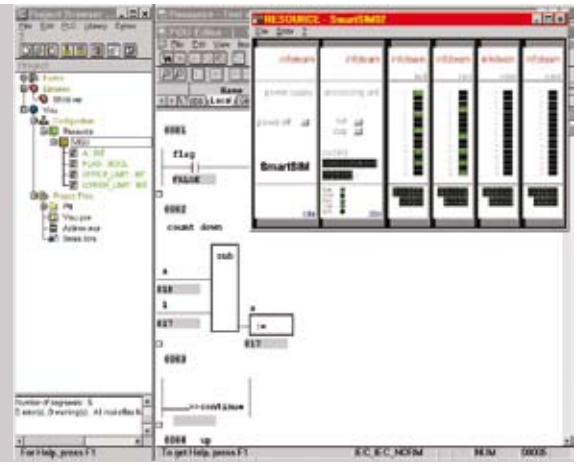
I/O LUX

Fidia I/O LUX input/output modules are based on infrared optical transmission technology.

I/O LUX modules can satisfy any input/output requirement, offering a wide range of solutions thanks to their high configurability.

I/O LUX modules can be mounted on a DIN bar to form a chain of modules up to a maximum of 32 chains of 32 modules each.

Modules can be used for digital inputs/outputs, analog inputs/outputs, thermal probes, serial lines, counting devices.



Profibus-DP

The Profibus-DP interface is one of the most widely used standard systems for managing communication between distributed I/O devices. Together with the IEC1131 PLC, it enables high levels of standardization of automation systems to be achieved.

PLC IEC1131

The development system adopted by Fidia is a worldwide recognized standard for the programming of programmable logic controllers.

Different programming languages can be used:

- IL Instruction List
- FBD Function Block Diagram
- ST Structured Test
- LD Ladder Diagram

The modular design of the IEC1131 makes for powerful and flexible management of machine tool logics, while the relevant debugging can be performed on the NC, on board the machine or on an external PC. Furthermore, the programming and debugging tools can be installed and used on any PC.

Axis management

Interpolation up to 9 axes.

Ability to control analog and digital drives.

Management of Gantry axes, axes moved by more than one motor (tandem or anti-backlash), multiple axes, synchronous axes and PLC axes (index heads, tables, tool changers, etc).

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